Corey, D. T. and W. K. Taylor. 1989. Foliage-dwelling spiders in three central Florida plant communities. J. Arachnol., 17:97-106.

FOLIAGE-DWELLING SPIDERS IN THREE CENTRAL FLORIDA PLANT COMMUNITIES

David T. Corey[1] and **Walter K. Taylor**

Department of Biological Sciences
University of Central Florida
Orlando, Florida 32816 USA

ABSTRACT

Foliage-dwelling spiders were collected using sweep nets in pond pine, sand pine scrub, and flatwoods plant communities on the University of Central Florida campus near Orlando. Collections were made bimonthly from May, 1983 through March, 1984.

A total of 4,022 spiders was collected; 2,076 in pond pine, 1,258 in sand pine scrub, and 688 in flatwoods. Spider diversity was greatest in pond pine, followed by sand pine scrub and then flatwoods community. Similarity in spider species was greatest between pond pine and flatwoods.

Salticids represented 40.2% of the combined populations. *Misumenops celer* (Hentz) was found in all three plant communities and was abundant.

INTRODUCTION

The southeastern United States has a rich spider fauna. Investigators have studied the spider fauna in North Carolina (Barnes 1953; Barnes and Barnes 1955; Berry 1970, 1977). In Florida, Muma (1973), Rey and McCoy (1983), and Lowrie (1963, 1971) have sampled the spider fauna.

The foliage-dwelling spiders of the pond pine, sand pine scrub, and flatwoods communities have not been described. The scorpion, pseudoscorpion, opilionid, and ground surface spider faunas in these communities have been described (Corey and Taylor 1987).

This paper compares the foliage-dwelling spider faunas in the pond pine, sand pine scrub, and flatwoods communities. In addition we show seasonal differnces in the three communities.

MATERIALS AND METHODS

Study sites.—The three plant communities where our study occurred lie in the eastern part of the University of Central Florida campus, located approximately 17 km east of Orlando in Orange County (S10 R31E T22S). The three plant communities studied were pond pine, sand pine scrub and flatwoods. For a description of the plant communities, see Corey (1987) and Corey and Taylor (1987).

Methods.—The sweep net consisted of a 91.4-cm handle, 40.6-cm ring, and collecting bag made of white canvas. A single sweep consisted of; 1) first stroke

[1]Present address: Department of Zoology, Southern Illinois University, Carbondale, IL 62901 USA.

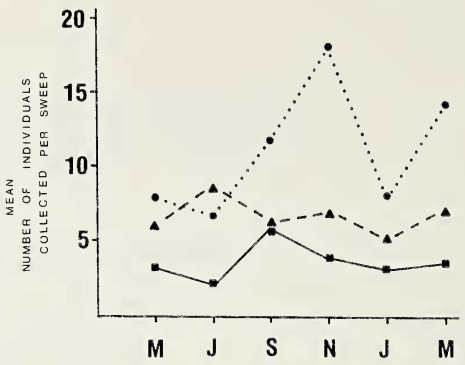

Figure 1.—Mean number of spiders caught on foliage using sweep nets in pond pine (●), sand pine scrub (▲), and flatwoods (■).

of the net started on the left and moved toward the right forming a 180 degree arc, 2) the second stroke covered the same area as the first stroke, but the net was moved in the opposite direction, 3) after completing the two strokes, one step forward was taken and the two-stroke method was repeated (for 100 steps), 4) then the 100 steps were retraced using the two-stroke method. Each sweep consisted of 1,200 strokes.

Thirty sets of sweeps per collecting month per plant community were made beginning in May 1983 and ending in March 1984 for a total of 540 sweeps. Sweeps were made on three consecutive days, one day for each community. All materials netted were placed into plastic bags and returned to the laboratory. Spiders were separated from the debris and placed into baby food jars containing 70% ethanol.

Identification.—Spiders were identified using a dissecting microscope. Difficult specimens were identified or verified by Jonathan Reiskind, University of Florida; James H. Redner, Biosystematics Research Institute; Norman I. Platnick, American Museum of Natural History; G. B. Edwards, Florida State Collection of Arthropods; and Jonathan Coddington, Smithsonian Institution.

All spiders were identified to lowest possible taxon. Many immatures were identified only to family level. Some spiders collected in poor condition could not be identified to family; these specimens are reported as undetermined (See Table 3).

RESULTS AND DISCUSSION

Four-thousand and twenty-two spiders from 18 families and 89 species were collected using sweep nets; 2,076 individuals, 14 families and 58 species from pond pine, 1,258 individuals, 15 families and 53 species from sand pine scrub, and 688 individuals, 13 families and 54 species from flatwoods. See appendix for a complete list of the spider species. An average of 7.45 spiders per sweep was observed. Figure 1 shows the mean number of individuals collected per sweep for the six collecting periods. Sixty-nine percent more spiders were found in pond pine than in flatwoods, 39% more in pond pine than in sand pine scrub, and 45% more in sand pine scrub than in flatwoods.

Analysis of guild composition shows differences between communities (Fig. 2). Guilds were patterned after Gertsch (1979). Guilds are (1) jumping spiders; Salticidae, (2) crab spiders; Thomisidae and Philodromidae, (3) aerial web spinners; Theridiidae, Linyphiidae, and Araneidae, (4) hunting spiders; Pisauri-

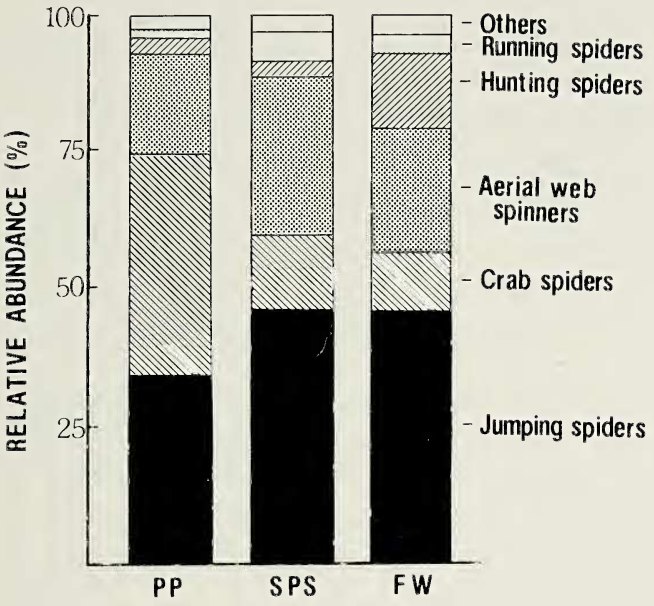

Figure 2.—Guild composition of individual spiders for the three study sites. PP = pond pine, SPS = sand pine scrub, and FW = flatwoods.

dae, Lycosidae, and Oxyopidae, (5) running spiders; Gnaphosidae, Clubionidae, and Anyphaenidae, and (6) others; remainder of the spiders. Relative abundance of jumping spiders declined in pond pine compared to that of sand pine scrub and flatwoods. Crab spiders increased substantially in pond pine.

Simpson's Index of Diversity was calculated for the three communities (Simpson 1949). Pond pine had a value of 0.84, sand pine scrub of 0.88, and flatwoods of 0.89. These low values may be due to the high species richness found in each community and the small number of dominant species.

Sorensen's Index of Similarity (Krebs 1978) was used to determine the similarities of spider species composition among communities. Species composition was more similar between pond pine and flatwoods (0.68), followed by sand pine scrub and flatwoods (0.63). Pond pine and sand pine scrub (0.57) were least similar. It was expected that habitats with similar vertical plant structure would be similar in spider species. This relationship, however, was not true; pond pine was less similar to sand pine scrub than to flatwoods as to species composition. Height and vertical structure of the vegetation swept may have allowed a greater spider abundance, but not a greater similarity in species. Pond pine had the highest understory swept (3 m) and the largest number of spiders, followed by sand pine scrub (averaged 2 m). Flatwoods with a low understory (averaged 1.5 m) had the smallest number of spiders.

Pond pine community had the most complex vegetation layer and this may have attributed to its having a greater spider abundance. Few herbaceous plants occurred in flatwoods as compared to pond pine and sand pine scrub. Flatwoods had a smaller surface area for spiders and this may account for the low abundance.

Table 1 shows the mean number of individual spiders occurring in the three communities. For each monthly mean, 95% confidence intervals were calculated as $x + t$ (SE) (Simpson et al. 1960). Pond pine in November was significantly different from the other communities in mean number of spider individuals.

Table 1.—Mean number of individual spiders occurring on foliage in the study sites by collection month.

	Community		
Collection month	Pond pine $\bar{x} \pm$ (SE)	Sand pine scrub $\bar{x} \pm$ (SE)	Flatwoods $\bar{x} \pm$ (SE)
May	81.33 (13.40)	64.33 (2.89)	34.33 (1.77)
July	70.67 (9.85)	90.00 (5.69)	26.00 (4.59)
September	123.33 (26.97)	66.00 (4.01)	10.41 (6.02)
November	186.00 (5.04)	73.00 (11.15)	10.26 (5.93)
January	81.67 (19.17)	53.33 (10.94)	8.14 (4.71)
March	147.67 (29.79)	98.33 (26.69)	8.14 (4.71)

Mean numbers of individuals captured in flatwoods in May, July, and September were less than and significantly different from sand pine scrub, but not from pond pine, which had large standard errors associated with the means. In contrast, mean number of spider species captured in flatwoods in July were significantly different ($p = 0.05$) from the other two communities (Table 2). Pond pine in November was significantly different from flatwoods in mean number of species. The lack of significant differences may be due to the large variance in number of individuals and species found among the communities.

Spider families, represented by individuals collected on foliage, are listed in Table 3. The three most common families for all communities were salticids, thomisids, and linyphiids; these represent 76.5% of all spiders captured in sweeps. In pond pine, thomisids, salticids, and linyphiids represented 82.4% of that community's total spider assemblage. In sand pine scrub, salticids, linyphiids, and thomisids represented 74.8% of the total spider assemblage. In flatwoods, salticids, oxyopids, and araneids represented 71.6% of the total spider assemblage. Figure 3 shows seasonal abundance of three common families occurring on foliage.

Table 4 shows the 10 most common species collected by frequency of occurrence. Abundant species were *Thiodina sylvana* (Hentz) and *Misumenops celer* (Hentz).

Twenty-seven species occurred in all communities (Table 5). No single species was common in all three communities. Nine species of spiders were collected from only one of the three communities: *Uloborus qlomosus* (Walck.), *Pholcomma hirsutum* Emerton, *Neriene radiata* (Walck.), *Ceratinopsis* sp., *Tibellus oblongus* (Walck.) and *Zyqoballus rufipes* (Peckham & Peckham) in pond pine; *Hyptiotes*

Table 2.—Mean number of spider species occurring on foliage in the study sites by collection month.

	Community		
Collection month	Pond pine $\bar{x} \pm$ (SE)	Sand pine scrub $\bar{x} \pm$ (SE)	Flatwoods $\bar{x} \pm$ (SE)
May	17.33 (0.88)	16.00 (3.61)	12.33 (1.46)
July	14.33 (0.88)	17.33 (1.46)	8.00 (0.58)
September	13.67 (1.46)	11.00 (0.58)	13.33 (2.89)
November	18.33 (0.88)	15.33 (1.77)	12.00 (0.58)
January	10.67 (0.34)	11.67 (0.88)	8.33 (0.88)
March	17.67 (1.86)	15.67 (1.77)	13.00 (1.53)

Table 3.—Number of individuals and percent of spiders by family for the three communities collected with sweep nets.

	Pond pine		Sand pine		Flatwoods		Total	
	#	%	#	%	#	%	#	%
Uloboridae	6	0.3	5	0.4	0	0.0	11	0.3
Dinopidae	1	0.1	0	0.0	0	0.0	1	0.02
Dictynidae	0	0.0	1	0.1	0	0.0	1	0.02
Theridiidae	95	4.6	52	4.1	20	2.9	167	4.2
Linyphiidae	168	8.1	206	16.4	35	5.1	409	10.2
Linyphiinae	93	4.5	6	0.5	20	2.9	119	3.0
Erigoninae	75	3.6	200	15.9	15	2.2	290	7.2
Araneidae	115	5.5	101	8.0	79	11.5	295	7.3
Tetragnathidae	10	0.5	2	0.2	16	2.3	28	0.7
Agelenidae	0	0.0	0	0.0	7	1.0	7	0.2
Hahniidae	0	0.0	4	0.3	0	0.0	4	0.1
Pisauridae	0	0.0	0	0.0	2	0.3	2	0.05
Lycosidae	3	0.1	1	0.1	0	0.0	4	0.1
Oxyopidae	27	1.3	43	3.4	92	13.4	162	4.0
Gnaphosidae	3	0.1	1	0.1	3	0.4	7	0.2
Clubionidae	35	1.7	30	2.4	6	0.9	71	1.8
Anyphaenidae	19	0.9	34	2.7	11	1.6	64	1.6
Thomisidae	836	40.3	146	11.6	66	9.6	1048	26.1
Philodromidae	9	0.4	3	0.2	3	0.4	15	0.4
Salticidae	706	34.0	589	46.8	321	46.7	1616	40.2
Undetermined	43	2.1	40	3.2	27	3.9	110	2.7

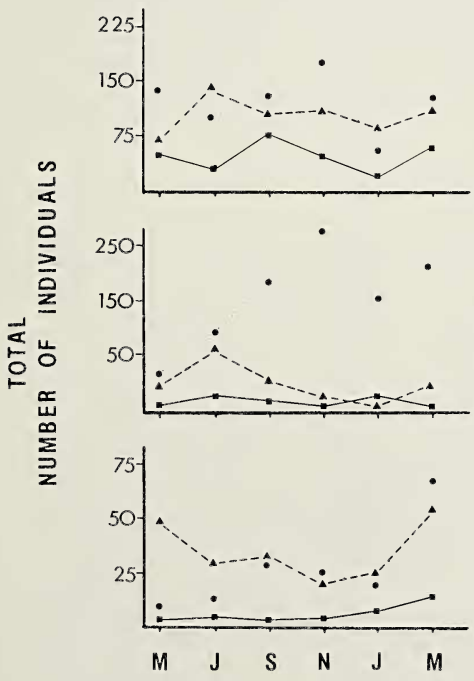

Figure 3.—Seasonal distribution of the most common families of foliage-dwelling spiders caught with sweep nets in pond pine (●), sand pine scrub (▲), and flatwoods (■). Salticidae (upper), Thomisidae (middle), and Linyphiidae (lower).

Table 4.—Ten most common spider species ranked by frequency of occurrence within each plant community. NR = no rank assigned.

Species	Pond pine	Sand pine scrub	Flatwoods
Synema viridans	1	NR	9
Thiodina sylvana	2	5	5
Misumenops celer	3	4	3
Lyssomanes viridis	4	3	NR
Frontinella pyramitela	5	NR	8
Theridula sp.	6	NR	NR
Hentzia palmarum	7	1	1
Phidippus pulcherrimus	7	NR	NR
Grammonota sp. #1	9	2	NR
Leucuage venusta	10	NR	NR
Grammonota sp. #2	NR	6	NR
Hypsosinga pygmaea	NR	7	NR
Aysha gracilis	NR	8	NR
Marpissa pikei	NR	9	4
Tmarus floridensis	NR	10	NR
Peucetia viridans	NR	NR	2
Phidippus sp.	NR	NR	6
Acacesia hamata	NR	NR	7
Oxyopes salticus	NR	NR	9

Table 5.—Spiders occurring in all three plant communities. R = rare (less than 1% of total population for that community), P = present (1% to 4.9% of total population), and C = common (5% or more of the total population).

Species	Pond pine	Sand pine scrub	Flatwoods
Theridula sp.	P	P	R
Thymoites unimaculatum	R	P	R
Frontinella pyramitela	P	R	P
Grammonota sp. #1	P	C	P
Leucauge venusta	P	R	R
Argiope aurantia	R	R	P
Acacesia hamata	R	P	P
Neoscona domiciliorum	R	R	R
Hypsosinga pygmaea	R	P	R
Wagneriana tauricornis	R	R	R
Peucetia viridans	R	P	C
Oxyopes salticus	R	R	P
Aysha gracilis	R	P	P
A. velox	R	R	R
Tmarus floridensis	R	P	R
Misumenops celer	C	C	P
Synema viridans	C	R	P
Paramaevia michelsoni	R	R	R
Marpissa pikei	R	P	P
Hentzia palmarum	P	C	C
Zygoballus rufipes	R	R	R
Thiodina sylvana	C	P	P
Lyssomanes viridis	C	C	R
Phidippus sp.	R	R	P
Phidippus pulcherrimus	P	R	R

cavatus (Walck.) in sand pine scrub; and *Agelenopsis naevia* (Walck.) and *Coriarachne* sp. in flatwoods.

Peucetia viridans (Hentz) and *Lyssomanes viridis* (Walck.) overwintered as juveniles. Berry (1971) found several spider species to overwinter as juveniles in the North Carolina Piedmont. He also found that adults and juveniles of some species appeared in large numbers at the same time of the year after a period of time when no or very few adults and juveniles were found. The following spiders exhibited this behavior in our study: *Grammonota* sp. #1 and *Misumenops celer* in pond pine, *Thymoites unimaculatum* (Emerton) and *Hypsosinqa pyqmaea* (Sundevall) in sand pine scrub, and *Hentzia palmarum* (Hentz) in flatwoods. This behavior may be a result of rapid maturation.

Lowrie (1963, 1971) studied oxyopids in the vegetation strata in northern Florida. Of five species he collected, *Oxyopes salticus* (Hentz) and *Peucetia viridans* were represented in our study.

Rey and McCoy (1983) studied arachnids for fifteen months in tidal marshes of northwest Florida and collected 47 species and 14 families. The following eight species were represented in their study and in our study: *Nephila clavipes* (L.), *Oxyopes salticus, Peucetia viridans, Tetraqnatha laboriosa* Hentz, *Florinda coccinea* (Hentz), *Metaphidippus galathea* (Walck.), *Marpissa pikei* (G. & E. Peckham), and *Synemosyna petrunkevitchi* (Chapin).

ACKNOWLEDGMENTS

We thank Jonathan Reiskind, Jonathan Coddington, G. B. Edwards, Norman I. Platnick, and James Redner for examining specimens. In addition, we thank I. Jack Stout, David H. Vickers, Henry O. Whittier, Al Fliss, and Michael D. Albig for their assistance throughout this study. Jonathan Reiskind and G. B. Edwards made helpful comments to improve an earlier draft of the manuscript. This work was supported by a grant to David T. Corey from the Exline-Frizzell Fund for Arachnological Research, grant No. 8.

LITERATURE CITED

Barnes, R. D. 1953. The ecological distribution of spiders in non-forest maritime communities at Beaufort, North Carolina. Ecol. Monog., 23:315-337.

Barnes, R. D. and B. M. Barnes. 1955. The spider population of the abstract broomsedge community of the southeastern Piedmont. Ecology, 36: 658-666.

Berry, J. W. 1970. Spiders of the North Carolina Piedmont old-field communities. J. Elisha Mitchell Sci. Soc., 86:97-105.

Berry, J. W. 1971. Seasonal distribution of common spiders in the North Carolina Piedmont. American Mid. Nat., 85:526-531.

Corey, D. T. 1987. Arachnid fauna in three central Florida plant communities. M.S. thesis, University of Central Florida, Orlando, FL. 290 pp.

Corey, D. T. and W. K. Taylor. 1987. Scorpion, pseudoscorpion, and opilionid faunas in three central Florida plant communities. Florida Scient., 50:162-167.

Corey, D. T. and W. K. Taylor. Ground surface spiders in three central Florida plant communities. J. Arachnol., 16:213-221.

Gertsch, W. J. 1979. American Spiders. Van Nostrand Reinhold, New York.

Krebs, C. J. 1978. Ecology: The Experimental Analysis of Distribution and Abundance. Harper & Row. New York.

Lowrie, D. C. 1963. The effects of grazing and intensive collecting on a population of the green lynx spider. Ecology, 44:777-781.
Lowrie, D. C. 1971. Effects of time of day and weather on spider catches with a sweep net. Ecology, 52:348-351.
Muma, M. H. 1973. Comparison of ground surface spiders in four Central Florida ecosystems. Florida Entomol., 56:173-196.
Rey J. R. and E. D. McCoy. 1983. Terrestrial arthropods of Northwest Florida salt marshes: Araneae and Pseudoscorpiones (Arachnida). Florida Entomol., 66:497-503.
Simpson, E. H. 1949. Measurement of diversity. Nature, 163:688.
Simpson, G. G., A. Roe and R. C. Lewontin. 1960. Quantitative Zoology. Harcourt, Brace and Co., New York.

Manuscript received July 1988, revised October 1988.

APPENDIX

SPIDERS IN THREE CENTRAL FLORIDA PLANT COMMUNITIES

Species of spiders collected with sweep nets are listed by family and community: Pond pine (PP), sand pine scrub (SPS), and flatwoods (FW).

Family	Species	PP	SPS	FW
Dinopidae	1. *Dinopis spinosa* Marx	1		
TOTALS		1	0	0
Uloboridae	2. *Uloborus glomosus* (Walck.)	6		
	3. *Hyptiotes cavatus* (Hentz)		5	
TOTALS		6	5	0
Dictynidae	4. *Dictyna* sp.		1	
TOTALS		0	1	0
Theridiidae		13	17	9
	5. *Pholcomma hirsutum* Emerton	7		
	6. *Spintharus flavidus* Hentz	1		1
	7. *Theridula* sp.	66	17	4
	8. *T. unimaculatus* (Emerton)	2	17	3
	9. *Theridion flavonotatum* Becker	1		2
	10. *Steatoda triangulosa* (Walck.)	1	1	
	11. *Stemmops bicolor* (OPC)	1		
	12. *Argyrodes elevatus* (Walck.)	3		1
TOTALS		95	52	20
Linyphiidae				
Linyphiinae		3	3	1
	13. *Frontinella pyramitela* (Hentz)	68	3	14
	14. *Neriene radiata* (Walck.)	7		
	15. *Florinda coccinea* (Hentz)	15		5
Totals		93	6	20
Erigoninae		16	16	5
	16. *Grammonota* sp. #1	48	142	7
	17. *Grammonota* sp. #2	3	36	
	18. *Grammonota* sp. #3		4	
	19. *Ceratinopsis* sp.	6		
	20. Species #1	1		
	21. Species #2	1		
	22. Species #3		2	3
TOTALS		75	200	15

Araneidae		17	10	25
	23. *Gasteracantha elipsoides* (Walck.)	1		
	24. *Micrathena gracilis* (Walck.)	1	2	
	25. *M. sagittata* (Walck.)	1		
	26. *Leucauge venusta* (Walck.)	43	4	2
	27. *Nephila clavipes* (Linnaeus)	1		
	28. *Argiope* sp.			1
	29. *A. aurantia* Lucas	5	12	8
	30. *Mangora placida* (Hentz)	9		6
	31. *Acanthepeira stellata* (Marx)	2		10
	32. *Acacesia hamata* (Hentz)	6	24	15
	33. *Neoscona arabesca* (Walck.)			1
	34. *N. domiciliorum* (Hentz)	3	1	1
	35. *Araneus minatus* (Walck.)	1	1	
	36. *Hyposinga rubens* (Hentz)		13	1
	37. *H. pygmaea* (Sundevall)	1	28	3
	38. *Wagneriana tauricornis* (OPC)	15	5	1
	39. *Scoloderis cordatus* (Tacz.)		1	1
	40. Species #1	9		4
TOTALS		115	101	79
Tetragnathidae		7	1	8
	41. *Tetragnatha* sp.	2		3
	42. *T. laboriosa* Hentz	1		2
	43. *T. straminea* Emerton		1	3
TOTALS		10	2	16
Agelenidae				2
	44. *Agelenopsis naevia* (Walck.)			5
TOTALS		0	0	7
Hahniidae				
	45. *Hahnia cinerea* Emerton		4	
TOTALS		0	4	0
Lycosidae		3	1	0
Pisauridae		0	0	2
Oxyopidae		5	22	35
	46. *Peucetia viridans* (Hentz)	18	15	45
	47. *Oxyopes salticus* (Hentz)	4	6	11
	48. *Hamataliwa grisea* Key.			1
TOTALS		27	43	92
Gnaphosidae		3		3
	49. *Poecilochroa decorata* (Kaston)		1	
TOTALS		3	1	3
Clubionidae		14	25	5
	50. *Trachelas deceptus* (Banks)		1	
	51. *T. similis* (FOP Cambridge)		1	
	52. *Chiracanthium inclusum* (Hentz)	1	2	
	53. *Clubionoides* sp.	20		1
	54. *C. gertschi* Kaston		1	
TOTALS		35	30	6
Anyphaenidae		2		1
	55. *Aysha gracilis* (Hentz)	10	27	7
	56. *A. velox* (Becker)	3	7	3
	57. *Wulfila alba* (Hentz)	4		
TOTALS		19	34	11
Thomisidae		43	28	14
	58. *Tmarus* sp.		4	2
	59. *T. floridensis* Key.	4	25	3
	60. *Misumenops celer* (Hentz)	190	75	26
	61. *Misumenops asperatus* (Hentz)		4	

	62. *M. oblongus* (Key.)		1	
	63. *Misumenoides formosipes* (Walck.)	1		4
	64. *Synema viridans* (Banks)	598	9	11
	65. *Coriarachne* sp.			5
	66. *Xysticus variabilis* Key.			1
TOTALS		836	146	66
Philodromidae				
	67. *Ebo contrastus* (RJS & NIP)	1		
	68. *Philodromus placidus* Banks		1	
	69. *P. rufus* Walck.		2	3
	70. *P. formosipes* (Walck.)	3		
	71. *Tibellus oblongus* (Walck.)	5		
TOTALS		9	3	3
Salticidae		106	132	106
	72. *Synemosyna formica* (Hentz)		2	
	73. *S. petrunkevitchi* (Chapin)			1
	74. *Peckhamia picata* (Hentz)		3	
	75. *Paramaevia michelsoni* (Barnes)	4	6	6
	76. *Marpissa pikei* (G & E Peckham)	11	26	24
	77. *Agassa cerulea* (Walck.)			1
	78. *Hentzia palmarum* (Hentz)	52	265	127
	79. *Zygoballus rufipes* P&P	11	1	1
	80. *Z. sexpunctatus* (Hentz)		1	2
	81. *Thiodina sylvana* (Hentz)	299	71	19
	82. *T. peurpera* (Hentz)	1		1
	83. *Phidippus audax* (Hentz)			3
	84. *P. pulcherrimus* Key.	52	1	6
	85. *Phidippus* sp.	13	6	16
	86. *Metaphidippus galathea* (Walck.)	1	1	
	87. *M. tillandsiae* Kaston		2	2
	88. *Admestine tibialis* (CL Koch)		4	
	89. *Lyssomanes viridis* (Walck.)	156	67	6
TOTAL		706	589	321
Unplaced		43	40	27